

LIVING WORLD



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Life is found in extraordinary habitats

- ① Hot springs
- ② Cold mountains
- ③ Deciduous forests
- ④ Oceans
- ⑤ Fresh water lakes
- ⑥ Deserts

① Ecological conflict

② Cooperation among members of population

③ Molecular traffic inside a cell among population of community

makes us deeply reflect on what is life

★ Ernst Mayr - ① Darwin of 20th century
② Gave def. of biological species

What is living?

emergence. self organ. rise
 interact
 Growth
 Reproduction
 ability to sense environm.
 metabolism
 ability to self replicate
 mount a suitable response

ALL ORGANISMS GROW →

① Increase in mass

② Increase in number.

→ twin charact. of Growth.

Multicellular org.

Unicellular org.

Grows by cell division

★ Plants → Growth by cell division occurs continuously throughout life span
 Animals → Growth seen upto a certain age.

observed in vitro by counting no. of cells

★ Cell division occurs in "certain" tissues → to replace lost cells.

★ Majority of higher animals → Growth
 plants → Reprod. } mutually exclusive events.

* One must remember, ↑ in body mass = growth.

if we take this as a criterion

Accumulation of material on the surface

This kind of growth

mountains

Boulders

sand mounds

Non living

objects grow

• In living org - growth is from inside

growth cannot be taken as defining property of living org.

conditions under which it can be observed in all living beings have to be explained.

Then, it's a charact. of living system.

★ A dead organism does not grow.

REPRODUCTION

• In multicellular org. repr. refers to Production of progeny more or less similar to those of parents.

Invariably we refer to Sex. reproduction

Asexual Reprod.

★ Fungi

Fragmentation

proth. mass

multiply

spread

Fungi

easy due to millions of asexual spores

Budding

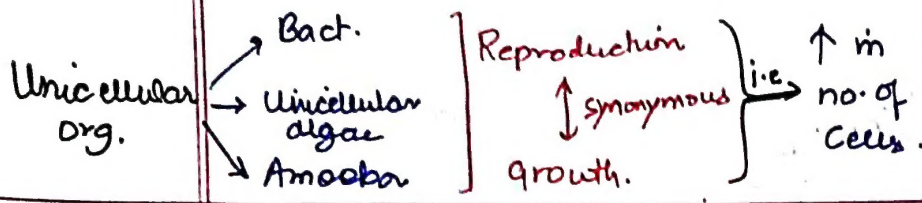
lowest org.

yeast

hydra

Planaria

True reg. generation



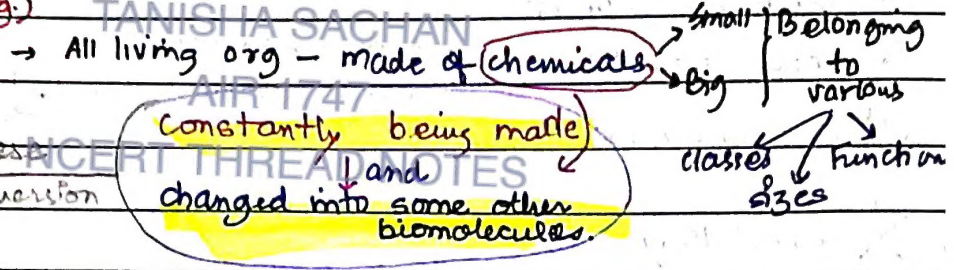
Do not reproduce sterile marker bees, infertile human couple

Hence, repr. also cannot be an inclusive defining characteristic of living org.

* NO, non-living object is capable of reproducing / replicating by itself

(defining feature of all living org.)

METABOLISM



Chemical react.

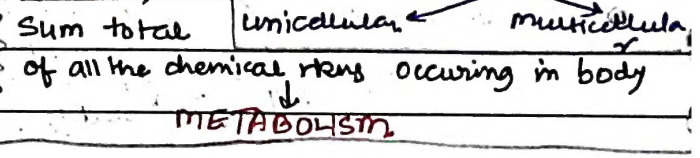
OR

Metabolic react.

• 1000s of metabolic reactions occurring simultaneously inside all living organism

- All → plants
- animals
- fungi
- microbes

exhibits metabolism



* NO non living object exhibits metabolism

* An isolated metabolic reaction(s) outside the body of an organism, performed in a test tube is neither living nor non living.

* demonstrated outside the body in cell free systems.

Isolated metabolic rxns in vitro are not living things but surely living rxns.

★ Cellular Organisation of the body is defining feature of life forms.

→ defining property

CONSCIOUSNESS

Most obvious

technically complicated

feature of all living organism is

We sense env. through our sense organs.

ability to sense the environment. Stimuli

other organism

physical / chemical / Biological

Plants - respond to External factors

- light
- water
- Temp
- pollutants

All org. from prok → eukary. (most complex) can sense & respond to environmental cues

* Photoperiod affects reproduction in seasonal breeders both → plants → animals

* All org → "aware" of surrounding

* Human being → "(self consciousness) aware" of himself

All org. registers chemical entering the body. This is consciousness

Human beings - more difficult to define living state

Patient is otherwise brain dead & has no self-consciousness

heart / lungs

Virtually supported by machines which replace

Coma people

Living phenomena — due to underlying interactions.

Properties of tissue not in the constituent cells but arise as a interaction among the cells.

Properties of cellular organisms not present in molecular constituents of organisms but due to interaction among them.

results in

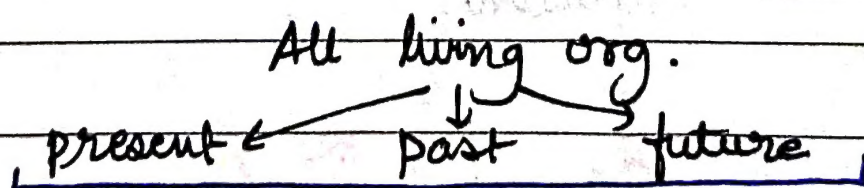
- Emergent properties at a higher level of organisation.

* This phenomena is true in hierarchy of organisational complexity at all levels.

↓ Thus

- Living org. capable of
 - self replicating
 - evolving
 - self regulatinginteractive systems. capable of responding to external stimuli.

- Biology — story of life on earth
Story of evolution of living org. on earth.



linked to one another by sharing

Common genetic material

but to varying degrees

Diversity in Liv. Beings.

born 2 inspire

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As we explore —————> new areas

and even

old ones

new org are continuously being identified.

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AIR 1747

NCERT THREAD NOTES

Area of observation & Variety of organism

* No. of species known & described range

↓
1.7 - 1.8 million

Biodiversity -
on earth.

Number

&
Type

of organisms present

Nomenclature - Standardizing the naming of living organism.

possible only
when ↓

Identification

- Description of organisms correctly and we know to what org. the name is attached to

ICBN - International Code for Botanical Nomenclature

ICZN " " " Zoological " " "

Scientific name ensures that each org. has only one name.

Naming System ^{given by} → Carolus Linnaeus → Binomial Nomenclature

Universal Rules of Nomenclature:

1. Biological names - Generally in Latin & written in italics

(1) Latinised OR (2) derived from Latin → irrespective of their origin.

2. Biological name → First word → Genus
→ Second word → Specific epithet

3. Both the words - in Biological name ^{when handwritten} → separately underlined OR ^{to indicate} Latin origin → printed in italics

4. First word - genus → starts with capital letter
Second word - Specific epithet → starts with small letter

* Name of author → appears after Specific Epithet

→ written in abbreviated form
→ *Mangifera indica* (Linn) → indicates species was described by Linnaeus.

TAXA → (can indicate categories at very diff. levels)

Eg → mammals (Class)
→ animals (K)
→ dogs (Canidae - Family)

Classification - process by which anything is grp into convenient categories.

Scientific term for categories
↓
taxa

unique to

- 1) Characterisation
- 2) Identification
- 3) Classification
- 4) Nomenclature

basic to

Taxonomy

process of classification

Based on characteristics all living organisms can be classified into different taxa.

Ecological information of organism

Ext & Int. structure

Structure of cell

Development process

← Basis of Modern Taxonomy

Human being wanted to know more about org. → w.r.t → their own use

○ Human beings - found sources for their BASIC NEEDS → food, clothing, shelter

* Earliest Classification based on → uses of various organisms

they also wanted to know relationship among organisms

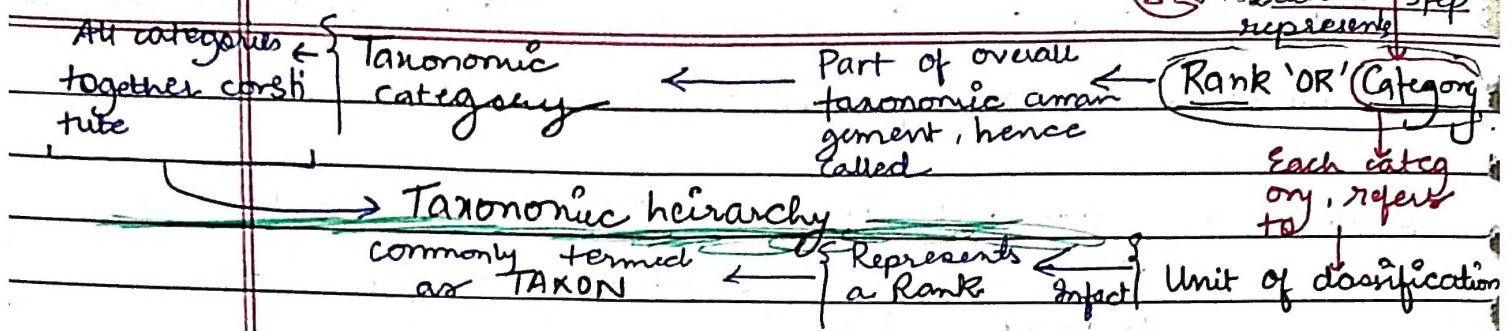
Systematics → Latin origin { Linnaeus - *Systema Naturae* (title of his publication)

Systematic arrangement of organisms

1) Identification
2) Nomenclature
3) Classification → included in → Systematics → takes into account → evolutionary relationships b/w organisms

TAXONOMIC CATEGORIES

Classification → NOT a single step process → is a hierarchy of step



Insects → represents → a grp of organisms sharing common feature like 3 pair of jointed legs.

Thus given Rank or Category ← [Thus, insects are recognizable concrete objects that can be classified]

* Grp represents category denotes Rank/Taxon represents Unit of classif.*

* These taxonomic grps/category are distinct biological entities & not merely morphological aggregates. Imp

Taxonomic Studies → of all known organism → led to development of common categories

[Species - lowest category in both plants & animals] Kingdom Phylum Division

Basic Requirement → Knowledge of characters of an individual or group of organisms → To classify them

Imp Identifying similarities & dissimilarities among the individuals of same kind of organisms as well as of other kinds of organisms.

SPECIES

• Grp of individuals with fundamental similarities → species → One should be able to distinguish one species from another

* Each genus may have one OR more specific epithets. Morphological similarities but with representing diff organism. distinct morphological difference.

* Panthera → leo → lion, pardus → leopard, tigris → tiger. * Solanum → tuberosum (potato), melongena (brinjal), nigrum (eggplant). * Homo → sapiens

GENUS comprise of Grp of related species which has more chr. common in comparison to species to other genera.

aggregates of closely related species

(Potato & Brinjal → same genus (Solanum)) (Lion, tiger, leopard → same genus) (Felis - genera of cats)

FAMILY

→ grp of related genera with still less no. of similarities as compared to
 → characterised on
 Veg. features of plant species
 Reprod. features of plant species
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 Canidae - dogs family
 Panthera
 Felis → Felidae

[Noctua, Pectunia, Solanum] → Family - solanaceae

ORDER → Assemblage of families which exhibit a few similar chrs.

[Plant families] → Convolvulaceae
 Solanaceae → Order: polygonales
 (based on floral chr)

are less in no as compared to
 diff. genera included in a family

[Felidae, Canidae] → order Carnivora

CLASS → includes related orders

Mammalia
 class.

order: Primata → monkey, gorilla, gibbon
 Carnivora → tiger, cat, dog

PHYLUM

fishes, amphibians, Reptiles, birds, Mammals

CHORDATA

common features: notochord, dorsal hollow neural system

Division

KINGDOM

plantae - plants
 Animalia - animals
 Lower the taxa, more the characteristics that the members share within taxon.

K
 P/D
 C
 O
 F
 G
 S

Ascending order

No of common chr. decreases

Difficulty of determining the relationship to other taxa at same level.

problem of classification more complex

broad categories (7)

however

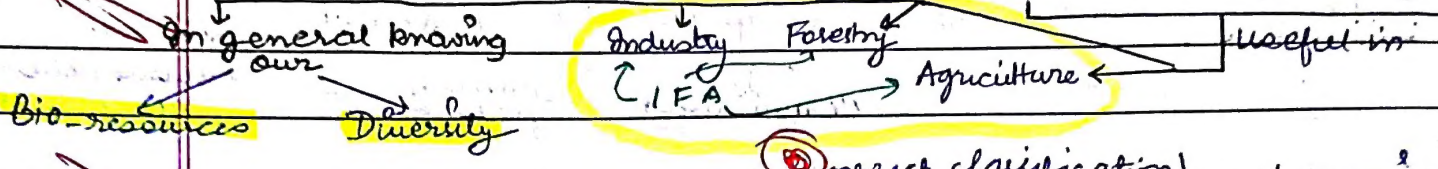
Taxonomists have developed sub-categories to facilitate more sound & scientific placement of various taxa.

Common name	Bio. name	G	F	O	C	P/D
Man	Homo Sapiens	Homo	Hominidae	Primate	Mammalia	Chord.
Housefly	Musca Domestica	Musca	Muscidae	Diptera	Insecta	Arthrop.
Mango	Mangifera Indica	Mangifera	Anacardiaceae	Sapindales	Dicotyledonae	Angi
Wheat	Triticum aestivum	Triticum	Poaceae	Poales	Monocotyledonae	Angi

Genus — Tribe — Subfamily

TAXONOMICAL AIDS

Taxonomic studies of various species of
 → plants
 → animals
 → other organisms



These studies would require
 → correct classification of organisms
 → identification
 → intensive laboratory
 → requires field studies

The collection of actual specimens of
 → plants
 → animals
 is essential & is a prime source of taxonomic studies.

These are also fundamental to studies & essential for training in systematic

Used for classification of an organism, & information gathered is also stored along with the specimens.

In some case, specimens → preserved for future studies

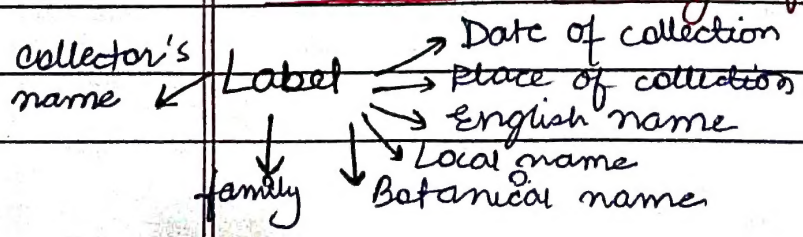
Biologists have - established procedures & techniques, to store & preserve inf. as well as specimens.

HERBARIUM

"Storehouse of collected plant specimens that are
 → dried
 → Pressed
 On sheets
 → Preserved

These sheets are arranged $\frac{acc^n}{to}$ → Universally accepted system of classification.

These specimens → with description on Herbarium sheets,
 "Storehouse" or "Repository" for future use
 ← become

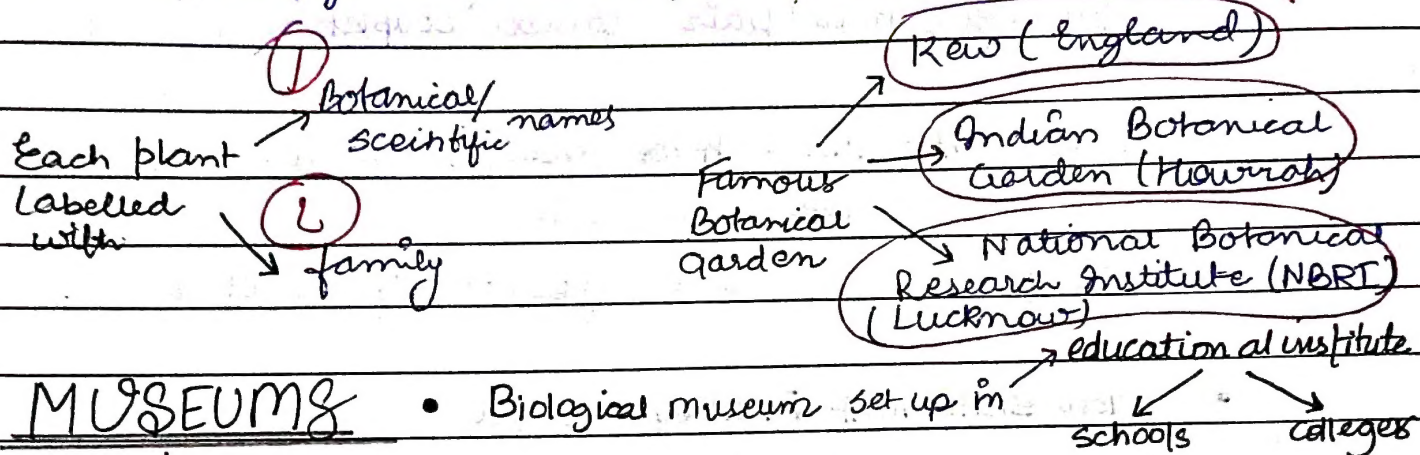


Herbaria serves as quick referral systems in taxonomical studies

BOTANICAL GARDENS

Specialised Garden → have collection of → Living plants for reference.

* Plant species grown here are for - identification purpose.



MUSEUMS

• Biological museum set up in

Have collection → Preserved

- Plant specimen
- Animal specimen

for ① Study & ② Reference

Specimen preserved in → Jars/Containers in → Preservative soln.

* Plant & Animal specimen may also be preserved as [dry specimens] *

Insects → Preserved in insect boxes after

- ① collected
- ② Killing
- ③ Pinning

Larger Animals

- Birds
- Mammals

usually ① Stuffed & ② preserved.

* Museums often have collections of skeletons of animals too.

ZOOLOGICAL PARKS → places → Wild animals are kept

enable us to learn about their

food habits

Behaviour

① in Protected environment
② under human care

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AIR 1747

NCERT THREAD NOTES

All animals in zoo → provided with → conditions similar to their natural habitat.

• Children love visiting there.

Commonly called → Zoos

KEYS ^{→ generally, analytical in nature}



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- Taxonomical Aid
- Used for - identification of plants & animals both
- Based on - similarities & dissimilarities

Keys are based on → contrasting characters

↓
Generally, in a pair called 'couplet'.

- It represents the - choice made b/w 2 opposite options
this ↓ results in

Acceptance of only one & rejection of the other.

- Each statement in a key - Lead

* Separate taxonomic keys are required for each taxonomic category for identification purposes.

← { family ← Genus ← Species

Some other means of recording description :
(They help in correct identification)

FLORA

Actual account of habitat & distribution of plants of a given area.

These provide index to plant species found in a particular area.

MANUALS

Providing information for identification of names of species found in an area.

MONOGRAPHS

Contains information on any one taxon.

helps in discriminating inf. for further

taxonomic studies by taxonomists prepared